

## S P E C I F I C A T I O N

## BACK SUPPORT APPARATUS FOR USE WITH A BACKPACK

## BACKGROUND OF THE INVENTION

The field of the invention pertains to back support devices. The invention relates more particularly to a back support apparatus for use with a backpack, wherein the back support apparatus has a pair of parallel air bladders which supportively cushions the backpack against at least the thoracic region of a user's back in vertical alignment with and on opposite sides of the user's spinal column.

It is popularly known that backpacks are a convenient means for carrying various articles on a user's back. While backpack designs may vary depending on use, such as for school, hiking, recreation, and other applications, they all share a common basic construction in which a pair of shoulder straps are used to transfer much of the weight of the backpack against a user's back. The resulting abutting relation of the backpack against the back and spinal column, however, can often cause backache,

1 pain and fatigue, especially if a heavily-laden backpack is  
2 carried over a period of time.

3 One of the areas of the back most affected by this abutting  
4 relation is the thoracic region of the back and spinal column.  
5 As can be seen in Figure 7 of the drawings, the spinal column's  
6 S-shaped configuration causes the backpack to rest predominantly  
7 against the thoracic region when worn. Moreover, the S-shaped  
8 curvature of the spinal column can produce uneven load  
9 distributions and contact pressures within the thoracic region  
10 itself. This is especially true when rigid flat objects such as  
11 books and folders are carried in the backpack. The substantially  
12 tangential contact produced between the front panel (12 in Figure  
13 1) and the user's back can concentrate load pressures on focal  
14 points and areas of the backbone which can pinch, stretch, or  
15 compress nerve roots. This can cause serious health problems  
16 such as nerve, osseous, musculature, or ligamentous deterioration  
17 or damage to the affected areas of the spine.

18 In an effort to improve comfort and reduce back-related  
19 pains and injuries when carrying backpacks, various devices have  
20 been developed for use with backpacks to provide support to  
21 specific target regions of a user's back. For example, in U.S.  
22 Patent No. 5,547,461 an inflatable lumbar support for a backpack  
23 is shown where a pocket is built into the lumbar region of a

1 backpack waist belt. An inflatable and removable bladder is  
2 inserted into the lumbar pocket for inflation by a hose connected  
3 to a hand pump. This device targets the lumbar region by using  
4 the inflatable bladder to fill the lumbar void and thus provide  
5 additional support thereto. However, it does not address the  
6 problems associated with the backpack-contacting areas of the  
7 thoracic region of the back and spinal column, and the need to  
8 relieve the loads and abutment pressures exerted thereon,  
9 especially when wearing or carrying a heavy-laden backpack.

10 Additionally, in U.S. Patent No. 4,420,103 a backpack is  
11 shown having an integral frame formed of plastic sheets without  
12 metal supports. In particular, a support pad is mounted on the  
13 front face of the backpack, with the support pad comprising a  
14 foam sheet, a stiffener sheet, and a protective sheet. While the  
15 foam sheet is positioned adjacent a user's back to cushion the  
16 backpack load, the ability of the support pad to flex completely  
17 and fully contour to the S-shape of the spinal column may be  
18 limited by the stiffener sheet. Instead, much of the support  
19 pad's ability to conform to the S-shape of the spinal column is  
20 provided by the pivoting action of the upper and lower sections  
21 best shown in Figure 5.

22 In summary, therefore, there is an unmet need for a back  
23 support device particularly designed to address the problems

1 caused and aggravated by the abutting relationship of the  
2 backpack to the thoracic region of the back. Such a device  
3 should be ergonomically designed to conform and contour to the  
4 particular S-shape and static and dynamic characteristics of the  
5 human spinal column in order to minimize and/or reduce the  
6 occurrence of fatigue, backaches, and other back-related health  
7 problems.

#### 8 BRIEF SUMMARY OF THE INVENTION

9 Thus, it is an object of the present invention to provide a  
10 back support apparatus for use with a backpack such that at least  
11 a thoracic region of a user's back is contouredly supported when  
12 the user wears the backpack.

13 It is a further object of the present invention to provide  
14 an inflatable back support apparatus for use with a backpack  
15 which vertically aligns with the user's spinal column on opposite  
16 sides thereof to provide cushioned and contoured support to at  
17 least the thoracic region of the user's back when the user wears  
18 the backpack.

19 It is a still further object of the present invention to  
20 provide a back support apparatus having multiple inflatable  
21 chambers such that one section or area of the back may be

1 supported differently from other area, as per the unique needs of  
2 the user.

3 A still further object of the present invention is to  
4 provide a simple and cost effective back support apparatus for  
5 use with a backpack having a minimal number of parts and which  
6 may be easily manufactured using conventional manufacturing  
7 methods.

8 The present invention is for a back support apparatus for  
9 use with a backpack. The back support apparatus comprises a pair  
10 of elongated, inflatable bladders which are spaced generally  
11 parallel to each other. The pair of elongated, inflatable  
12 bladders are adapted to be vertically connected to a front panel  
13 of the backpack. The vertical placement on the front panel of  
14 the backpack is to provide cushioned back support on opposite  
15 sides of a user's spinal column when the backpack is carried on a  
16 user's back. More particularly, the pair of elongated,  
17 inflatable bladders are connected to the front panel of the  
18 backpack to target at least the thoracic region of the user's  
19 back. Furthermore, the back support apparatus also comprises  
20 pump means for inflating the pair of bladders, and valve means  
21 for deflating the pair of bladders. The pump and valve means are  
22 preferably a hand pump having a flexible bulb configuration with  
23 a air release valve connected thereto.

## BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a partially broken front perspective view of a backpack incorporating the back support apparatus which is positioned inside a front panel pocket of the backpack.

Figure 2 is a cross-sectional side view taken along line 2-2 of Figure 1.

Figure 3 is a front elevational view of a second preferred embodiment of the back support apparatus having upper and lower support sections which are independently inflatable.

Figure 4 is a front elevational view of a third preferred embodiment of the back support apparatus having upper, middle, and lower support sections which are independently inflatable.

Figure 5 is a front elevational view of a fourth preferred embodiment of the back support apparatus having left and right bladders which are independently inflatable.

Figure 6 is a front perspective view of a backpack with the back support apparatus attached along the outer surface of the backpack.

Figure 7 is a schematic side view of the backpack and back support apparatus when worn and carried by a user. Figure 7 illustrates the placement of the back support apparatus with respect to the user's spinal column, especially the thoracic region.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, Figures 1-7 show the back support apparatus, generally indicated by reference character 10. Figure 1, in particular, is a front perspective view of the back support apparatus 10 mounted on a backpack, generally indicated by reference character 11. The backpack 11 shown in the drawings has a typical backpack construction with certain features common to all backpacks. As can be seen, the backpack 11 has a front panel 12 which faces a user's back when worn, and left and right shoulder straps 16 and 17, respectively, by which the backpack 11 is carried over a user's shoulders. Optionally, backpacks may include a waist belt 18 for securing around a user's waist for added security. Backpacks are typically constructed of a durable material, such as nylon, leather, or other material with strong, wear resistant qualities to withstand the rigors of use.

It is notable that while the term "backpack" is commonly understood to define a carrying apparatus of the type described above and typically used by students to carry books and by outdoor recreationalists when hiking or mountain climbing, it is not limited only to such. The term "backpack," as used herein and in the claims, broadly includes any and all parcels or objects which, when carried by a user, rests against the user's back. Furthermore, the term "front panel" is defined herein and

1 in the claims to mean that side of the backpack or object  
2 adjacent to and facing the back of a user when carried or worn.

3 As can be best seen in Figures 1 and 6, the back support  
4 apparatus 10 comprises a pair of inflatable bladders 20, 22 which  
5 surround and define inflation chambers 21, 23, respectively. The  
6 bladders 20, 22 are generally oriented parallel to each other and  
7 are vertically connected to the front panel 12 of the backpack  
8 11. The parallel bladders 20, 22 are preferably spaced a  
9 distance of at most 2 inches from each other to accommodate the  
10 spinal column therebetween, as will be discussed in detail below.  
11 However, other separation distances between the two bladders 20,  
12 22 may be suitably utilized as well. And preferably each bladder  
13 20, 22 has an inflated diameter of 2 inches, which has been found  
14 by applicant to be effective in providing a comfortable degree of  
15 cushioned support without being overly obtrusive during use.

16 In one preferred embodiment, the two bladders 20 and 22 are  
17 preferably connected by at least one bridge conduit which enables  
18 air to communicate between the respective inflation chambers. As  
19 shown in Figures 1 and 6, the top end 22' of the right bladder 22  
20 is communicably connected to a top end 20' of the left bladder 20  
21 by means of a top bridge conduit 24. Likewise, the bottom end  
22 22" of the right bladder 22 is also shown communicably connected  
23 to the bottom end 20" of the left bladder 20 by means of a bottom



1 bridge conduit 25. In the embodiment shown in Figures 1 and 6,  
2 the top and bottom bridge conduits 24, 25 operate together to  
3 equalize pressure between the two inflation chambers 21, 23.  
4 However, bridge conduits may alternatively operate independent of  
5 each other when independent support sections are provided in a  
6 multiple support section arrangement, as will be discussed in  
7 detail below. It is notable that the inflated diameters of the  
8 bridge conduits are preferably less than the inflated diameters  
9 of the elongated bladders 20, 22 such that contact by the  
10 bladders 20, 22 to the user's back is ensured. Furthermore, the  
11 bladders 20, 22 preferably have a flexible construction suitable  
12 for containing compressed air; construction may be from, for  
13 example, an elastomeric or polymeric material. Additionally, the  
14 bridge conduits are preferably integrally constructed together  
15 with the bladders.

16 As can be seen in Figures 1 and 6, a pump 30 is provided for  
17 generally inflating the bladders 20, 22. The pump 30 is  
18 preferably a hand-held and hand-operated pump having a flexible  
19 bulb-shaped configuration which resiliently biases when squeezed  
20 to effect pumping. However, it is also contemplated that other  
21 types of pumps may be utilized, such as a battery-operated pump  
22 for automatic inflation. Furthermore, the pump 30 is connected  
23 to a suitable location on the pair of bladders 20, 22 by means of

an inflation tube 32 preferably having an elastomeric construction. It is notable that the inflation tube 32 may be connected to the back support apparatus 10 at a suitable location. For example, the inflation tube 32 may be connected to either the left 20 or right 22 bladders, or either of the bridge conduits 24, 25. Preferably, the inflation tube 32 is sufficiently long to enable a user to conveniently reach and operate the pump 30. And as can be best seen in Figures 7, the pump 30 may be conveniently stored in a side pocket 19 of the backpack 11 for convenient access. Furthermore, the back support apparatus also comprises an air release valve 31 for deflating the bladders 20, 22. As shown in Figures 1 and 6, the air release valve 31 is preferably connected to the inflation tube 32 as part of the pump 30.

Generally, the pair of elongated bladders 20, 22 are vertically and centrally connected to the front panel 12 of the backpack 11 to effect cushioned and contoured support to a user's back. In particular, as can be seen in Figures 1 and 2, the pair of elongated, inflatable bladders 20, 22 are preferably retainably received and secured within an interstitial pocket volume 14 formed between the front panel 12 and a pocket wall 13. As shown in Figures 1 and 2, the pocket wall 13 is preferably located at an interior location of the backpack relative to the

front panel 12, such that it is the front panel 12 which comes in contact with the user's back. Alternatively, the pocket wall 13 may be positioned outside relative to the front panel 12 such that the pocket wall 13 may come in contact with the user's back. However, the actual positions of the front panel 12 and the pocket wall 13 relative to each other are inconsequential, so long as they serve to secure the pair of elongated bladders therein. It is also notable that the pocket wall 13 is preferably connected to the front wall 12 by being sewn or stitched together, or by other suitable means. The interstitial volume 14 thus formed may be completely enclosed whereby the pair of bladders 20, 22 may not be accessed or removed. Alternatively a pocket opening (not shown) may be provided through which said pair of bladders 20, 22 may be removably inserted into the interstitial volume 14.

The pair of elongated bladders 20, 22 may alternatively be mounted to the front panel 12 of the backpack 11 without the formation of an interstitial pocket volume 13. In this regard, another preferred embodiment is shown in Figure 6 utilizing securing straps 15 such that the elongated, inflatable bladders 20, 22 may be attached to an outer surface of the front panel 12. Thus the bladders may directly contact the user's back to effectuate cushioned support.

1 In this manner, and regardless of the manner of attachment,  
2 the pair of elongated, parallel bladders 20, 22 are vertically  
3 and centrally positioned on the front panel 12 of the backpack 11  
4 to vertically align with a user's spinal column (34 in Figure 7)  
5 when the backpack 11 is worn. Generally, the bladders 20, 22 may  
6 be sufficiently spaced from each other to exert a support force  
7 against the user's spinal column 34 from opposite sides of the  
8 spinal column 34. However, as discussed above, the bladders 20,  
9 22 are preferably spaced apart a distance of at most 2 inches, to  
10 enable the targeting of muscles surrounding and immediately  
11 anchored to the spinal column 34. As can be best seen in Figure  
12 7, placement of the elongated, inflatable bladders 20, 22 along  
13 the front panel is such that the bladders 20, 22 contouredly abut  
14 against at least the thoracic region 36 of the user's spinal  
15 column 34. It is notable however, that the length of the  
16 bladders 20, 22 may be further elongated to extend into the  
17 cervical and lumbar regions of the back and spinal column as well  
18 to provide even greater back support. In this manner, the pair  
19 of bladders 20, 22 operate to provide a fully-contoured and  
20 supportive intermediate cushion between the backpack 11 and at  
21 least the thoracic region 36 of the back and spinal column 34  
22 where much of the backpack load is exerted. As can be seen in  
23 Figure 7, the air-filled nature of the bladders 20, 22 enable the

1 bladders 20, 22 to conform and contour substantially completely  
2 to the curvature of the backbone and back, and thereby promote  
3 more even load distributions.

4 As can be seen in Figure 3, the pair of elongated,  
5 inflatable bladders 20, 22 may each comprise more than one  
6 inflation chamber. As shown in Figure 3 in particular, the right  
7 bladder 22 comprises an upper inflation chamber 23a and a lower  
8 inflation chamber 23b. The two inflation chambers 23a and 23b  
9 are divided by means of chamber divider 27 which is preferably a  
10 heat-sealed segment of the bladder body. Similarly, the left  
11 bladder 20 has an upper inflation chamber 21a and a lower  
12 inflation chamber 21b also formed by means of a chamber divider  
13 27. Furthermore, a top bridge conduit 24 communicably connects  
14 the upper inflation chamber 23a of the right bladder 22 with the  
15 upper inflation chamber 21a of the left bladder 20. And as shown  
16 in Figure 3, an upper pump 30a is connected to the left bladder  
17 20. The upper inflation chambers 23a and 21a, together with the  
18 top bridge conduit 24 define an upper support section which  
19 contacts an upper section of the user's back. This arrangement  
20 enables the inflation of the upper support section only.  
21 Similarly, a bottom bridge conduit 25 communicably connects the  
22 lower inflation chamber 23b of the right bladder 22 with the  
23 lower inflation chamber 21b of the left bladder 20. Furthermore,

1 with the attachment of a bulb pump 30b, a lower support section  
2 is created which may be independently inflated and deflated from  
3 the upper support section.

4 The concept of providing separate support sections is  
5 further illustrated in Figure 4 comprising a third and middle  
6 support section between the upper and lower support sections and  
7 sectioned off by means of chamber dividers 27. The middle  
8 support section comprises a middle inflation chamber 23c of the  
9 right bladder 22 and a middle inflation chamber 21c of the left  
10 bladder 20. The middle inflation chambers 21c and 23c are  
11 communicably connected by a middle bridge conduit 26 which  
12 enables air flow between the two middle inflation chambers 21c  
13 and 23c. With the addition of a bulb pump 30c, the middle  
14 support section may be independently inflated and deflated from  
15 the upper support section and lower support section. It is  
16 notable that the concept of having multiple support sections as  
17 shown in Figures 3 and 4 may be further extended to multiple  
18 support sections greater than three.

19 Finally, in Figure 5, a fourth embodiment of the bladder  
20 support apparatus is shown without the use of bridge conduits  
21 which enable communication of air between the bladders 20, 22.  
22 In Figure 5, the two elongated bladders, 20, 22 are structurally  
23 supported by a non-communicating connector limb 28, which merely

1 functions to maintain the gap spacing 29 therebetween and  
2 maintain the parallel orientation of the bladders. In this  
3 preferred embodiment, the left bladder 20 has a bulb pump 30" and  
4 the right bladder 22 has a bulb pump 30' such that the left  
5 bladder 20 may be independently inflated and deflated from the  
6 right bladder 22. This concept of providing separate and  
7 independent inflation capability of the left and right inflation  
8 chambers can be further extended where each bladder 20, 22 has  
9 multiple inflation chambers (example not shown).

10 In this manner, by enabling independent control of the  
11 inflation level of each inflation chamber, various points along a  
12 user's back can be targeted to provide optimal comfort and  
13 cushioned support as required by the unique needs of the  
14 individual.

15 The present embodiments of this invention are thus to be  
16 considered in all respects as illustrative and not restrictive;  
17 the scope of the invention being indicated by the appended claims  
18 rather than by the foregoing description. All changes which come  
19 within the meaning and range of equivalency of the claims are  
20 intended to be embraced therein.